Programmer's Aid for VIC 20™ Computer $3.98

BASIC KEYWORDS

Words	Definition	Tokens Dec.	Hex
ABS	Absolute Value	182	B6
AND	Logic operation	175	AF
ASC	Returns value of ASCII	198	C6
ATN	Arctangent	193	C1
CHR$	String Character	199	C7
CLOSE	Closes file	160	A0
CLR	Clears Variables	156	9C
CMD	Output to device or file	157	9D
CONT	Continue program	154	9A
COS	Cosine	190	BE
DATA	Data to be read	131	83
DEF	Define function	150	96
DIM	Demention array	134	86
END	End program	128	80
EXP	VAL of "e" to power	189	BD
FN	Variable prefix	165	A5
FOR	Used for loop	129	81
FRE	Bytes available	184	B8
GET	Accept single character	161	A1
GOSUB	Execute subroutine	141	8D
GO TO	Execute at line	137	89
IF	Logic operation	139	8B
INPUT	Accept value	133	85
INPUT#	Accept value	132	84
INT	Returns Integer	181	B5
LEFT$	Left part of string	200	C8
LEN	Character in string	195	C3
LET	Assign value	136	88
LIST	Basic program list	155	9B
LOAD	Basic program load	147	93
LOG	Returns Logarithm	188	BC
MID$	Center of string	202	CA
NEW	Remove basic program	162	A2
NEXT	Used for Loop	130	82
NOT	Logic operation	168	A8
ON	Use with goto or gosub	145	91
OPEN	Open file or device	159	9F
OR	Logic operation	176	B0
PEEK	Returns number value in memory	194	C2
POKE	Places number value in memory	151	97
POS	Print position	185	B9
PRINT	Prints to screen	153	99
PRINT#	Prints to file	152	98
READ	Obtains data	135	87
REM	Remark	143	8F
RESTORE	Reread data	140	8C
RETURN	Returns after Gosub	142	8E
RIGHT$	Right part of string	201	C9
RND	Random number	187	BB
SAVE	Save basic program	148	94
SGN	Returns sign	180	B4
SIN	Trig function sine	191	BF
SPC(	Prints spaces	166	A6
SQR	Square root	186	BA
STEP	Specifies increments	169	A9
STOP	Stop basic program	144	90
STR$	String of a number	196	C4
SYS	Transfer to sub system	158	9E
TAB(	Specific column print	163	A3
TAN	Tangent	192	C0
THEN	Used with IF statement	167	A7
TO	Used with FOR statement	164	A4
USR	Pass machine lang. parameter	183	B7
VAL	Return value of string	197	C5
VERIFY	Checks specific program	149	95
WAIT	Stops basic program execution	146	92

ASCII CODES

CODE Decimal	Hex	CHAR	CODE Decimal	Hex	CHAR	CODE Decimal	Hex	CHAR
000	00	NULL	040	28	(	080	50	P
001	01	SOH	041	29	)	081	51	Q
002	02	STX	042	2A	*	082	52	R
003	03	ETX	043	2B	+	083	53	S
004	04	EOT	044	2C	,	084	54	T
005	05	ENQ	045	2D	-	085	55	U
006	06	ACK	046	2E	.	086	56	V
007	07	BEL	047	2F	/	087	57	W
008	08	BS	048	30	0	088	58	X
009	09	HT	049	31	1	089	59	Y
010	0A	LF	050	32	2	090	5A	Z
011	0B	VT	051	33	3	091	5B	[
012	0C	FF	052	34	4	092	5C	backslash
013	0D	CR	053	35	5	093	5D	]
014	0E	SO	054	36	6	094	5E	↑
015	0F	SI	055	37	7	095	5F	←
016	10	DLE	056	38	8	096	60	SPC
017	11	DC1	057	39	9	097	61	a
018	12	DC2	058	3A	:	098	62	b
019	13	DC3	059	3B	;	099	63	c
020	14	DC4	060	3C	<	100	64	d
021	15	NAK	061	3D	=	101	65	e
022	16	SYN	062	3E	>	102	66	f
023	17	ETB	063	3F	?	103	67	g
024	18	CAN	064	40	@	104	68	h
025	19	EM	065	41	A	105	69	i
026	1A	SUB	066	42	B	106	6A	j
027	1B	ESC	067	43	C	107	6B	k
028	1C	FS	068	44	D	108	6C	l
029	1D	GS	069	45	E	109	6D	m
030	1E	RS	070	46	F	110	6E	n
031	1F	US	071	47	G	111	6F	o
032	20	SPC	072	48	H	112	70	p
033	21	!	073	49	I	113	71	q
034	22	"	074	4A	J	114	72	r
035	23	#	075	4B	K	115	73	s
036	24	$	076	4C	L	116	74	t
037	25	%	077	4D	M	117	75	u
038	26	&	078	4E	N	118	76	v
039	27	'	079	4F	O	119	77	w
						120	78	x
						121	79	y
						122	7A	z

MUSICAL NOTE TABLE

Note	Decimal	Hex	Note	Decimal	Hex
C	135	87	G	215	D7
C#	143	8F	G#	217	D9
D	147	93	A	219	DB
D#	151	97	A#	221	DD
E	159	9F	B	223	DF
F	163	A3	C	225	E1
F#	167	A7	C#	227	E3
G	175	AF	D	228	E4
G#	179	B3	D#	229	E5
A	183	B7	E	231	E7
A#	187	BB	F	232	E8
B	191	BF	F#	233	E9
C	195	C3	G	235	EB
C#	199	C7	G#	236	EC
D	201	C9	A	237	ED
D#	203	CB	A#	238	EE
E	207	CF	B	239	EF
F	209	D1	C	240	F0
f#	212	D4	C#	241	F1

Voice1 POKE 36874,X Octaves 1,2,3
Voice2 POKE 36875,X Octaves 2,3,4
Voice3 POKE 36876,X Octaves 3,4,5
Noise POKE 36877,X
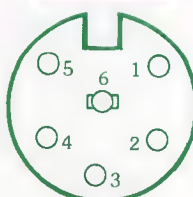Volume POKE 36878,0 OFF
To POKE 36878,15 Maximum

PRINTER COMMAND CODES

CHR$(14)	Double Width
CHR$(10)	Line Feed
CHR$(13)	Carriage return
CHR$(8)	Graphic mode
CHR$(15)	Standard
CHR$(16)	Position addr.
CHR$(27)	Dot Position
CHR$(26)	Graphic repeat
CHR$(17)	Upper/Lower
CHR$(145)	Upper Case
CHR$(18)	RVS ON
CHR$(146)	RVS OFF

COLOR CODES

0	BLACK	8	ORANGE
1	WHITE	9	LT. ORANGE
2	RED	10	PINK
3	CYAN	11	LT. CYAN
4	PURPLE	12	LT. PURPLE
5	GREEN	13	LT. GREEN
6	BLUE	14	LT. BLUE
7	YELLOW	15	LT. YELLOW

SCREEN AND BORDER COLOR COMBINATIONS

Screen — Border

	Blk	Wht	Red	Cyan	Pur	Grn	Blu	Yel
BLK	008	009	010	011	012	013	014	015
WHT	024	025	026	027	028	029	030	031
RED	040	041	042	043	044	045	046	047
CYAN	056	057	058	059	060	061	062	063
PUR	072	073	074	075	076	077	078	079
GRN	088	089	090	091	092	093	094	095
BLU	104	105	106	107	108	109	110	111
YEL	120	121	122	123	124	125	126	127
ORANGE	136	137	138	139	140	141	142	143
LT ORG	152	153	154	155	156	157	158	159
PINK	168	169	170	171	172	173	174	175
LT CYN	184	185	186	187	188	189	190	191
LT PUR	200	201	202	203	204	205	206	207
LT GRN	216	217	218	219	220	221	222	223
LT BLU	232	233	234	235	236	237	238	239
LT YEL	248	249	250	251	252	253	254	255

POKE 36879, (number from table above)

SERIAL I/O

Pin	Function
1	SERIAL SRQ IN
2	GND
3	SERIAL ATN IN/OUT
4	SERIAL CLK IN/OUT
5	SERIAL DATA IN/OUT
6	RESET

AUDIO VIDEO
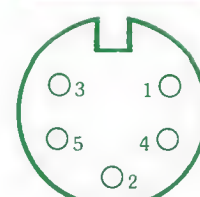
Pin	Function
1	+5V, REGULATED
2	GND
3	AUDIO
4	VIDEO LOW
5	VIDEO HIGH

KERNAL ROUTINES

Name	Address Decimal	Hex	Description
ACPTR	65445	$FFA5	Input A Byte Serial Port
CHKIN	65478	$FFC6	Open channel for Input
CHKOUT	65481	$FFC9	Open channel for output
CHRIN	65487	$FFCF	Input char. from channel
CHROUT	65490	$FFD2	Output Char. to channel
CIOUT	65488	$FFA8	Output Byte Serial Port
CLALL	65511	$FFE7	Close all channels+files
CLOSE	65475	$FFC3	Close a specified logical file
CLRCHN	65475	$FFC3	Close I/O channels
GETIN	65512	$FFE4	Get char. from Buffer
IOBASE	65523	$FFF3	Return I/O Base addr.
LISTEN	65457	$FFB1	Command serial to listen
LOAD	65493	$FFD5	Load RAM from device
MEMBOT	65436	$FF9C	Read/Set memory bottom
MEMTOP	65433	$FF99	Read/Set memory top
OPEN	65472	$FFC0	Open a logical file
PLOT	65520	$FFF0	Read/set X,Y cursor position
RDTIM	65502	$FFDE	Read clock
READST	65463	$FFB7	Read I/O status word
RESTOR	65415	$FF8A	Restore I/O Vectors
SAVE	65496	$FFD8	Save RAM to device
SCNKEY	65439	$FF9F	Scan keyboard
SCREEN	65517	$FFED	Return X,Y organization of screen
SECOND	65427	$FF93	Send secondary addr.
SETLFS	65466	$FFBA	Set Logical, 1st + 2nd addresses
SETMSG	65424	$FF90	Control KERNAL messages
SETNAM	65469	$FFBD	Set Filename
SETTIM	65499	$FFDB	Set clock
SETTMO	65422	$FFA2	Set Serial Bus timeout
STOP	65505	$FFE1	Scan stop key
TALK	65460	$FFB4	Command serial Bus device to talk
TKSA	65430	$FF96	Send secondary addr. after talk
UDTIM	65514	$FFEA	Increment clock
UNLSN	65454	$FFAE	Command serial bus to unlisten
UNTLK	65451	$FFAB	Command serial bus to untalk
VECTOR	65412	$FF84	Read/Set Vectored I/O

KERNAL ERROR CODES

0	Routine ended by stop key	5	Device not present
1	Too many open files	6	File is not an INPUT file
2	File already open	7	File is not an OUTPUT file
3	File not open	8	File name missing
4	File not found	9	Illegal device number

MEMORY MAP

Address		Function
$00	$FF	Page zero, Pointers, Accumulators, Flags
$100	$13E	Tape Error Log
$100	$1FF	Microprocessor Stack
$100	$10A	Floating/String work area
$200	$258	Basic Input Buffer
$259	$292	Operating system, tables, flags, keyboard
$293	$294	VIC Chip
$295	$2FF	Operating system, RS232 pointers, etc.
$300	$301	Error message link
$302	$32F	Vectors
$330	$3FB	Tape I/O
$400	$FFF	3K Expansion RAM
$1000	$1DFF	User Basic RAM (unexpanded VIC™)
$1E00	$1FFF	Basic memory screen area (unexpanded VIC™)
$2000	$3FFF	8K Expansion area
$4000	$5FFF	8K Expansion area
$6000	$7FFF	8K Expansion area
$8000	$8FFF	Character generator ROM
$9000	$900F	VIC Chip (6560)
$9110	$912F	VIA Chip (6522)
$9400	$95FF	Color RAM area
$9600	$97FF	Color RAM area
$9800	$9BFF	I/O Block 2
$9C00	$9FFF	I/O Block 3
$A000	$BFFF	Expansion ROM
$C000	$DFFF	Basic ROM
$E000	$FFFF	ROM Kernal Operating System

USER PORT

Pin	Function	Pin	Function
1	GND	A	GND
2	+5V	B	CB1
3	RESET	C	PB0
4	JOY0	D	PB1
5	JOY1	E	PB2
6	JOY2	F	PB3
7	LIGHT PEN	H	PB4
8	CASSETTE SWITCH	J	PB5
9	SERIAL ATN IN	K	PB6
10	+9V	L	PB7
11	GND	M	CB2
12	GND	N	GND

1	2	3	4	5	6	7	8	9	10	11	12
A	B	C	D	E	F	H	J	K	L	M	N

CURRENT KEY BEING HELD

Memory Location 197 or $C5
Peek (197)

KEY	#	KEY	#	KEY	#	KEY	#
←	08	•	14	E	49	U	51
1	00	↑	54	F	42	V	27
2	56	:	45	G	19	W	09
3	01	;	22	H	43	X	26
4	57	.	37	I	12	Y	11
5	02	/	30	J	20	Z	33
6	58	CRS ↕	31	K	44	NONE	64
7	03	CRS ↔	23	L	21	SP BAR	32
		F1	39	M	36		
8	59	F3	47	N	28		
9	04	F5	55	O	52		
0	60	F7	63	P	13		
+	05	A	17	Q	48		
−	61	B	35	R	10		
3	06	C	34	S	41		
HOM	62	D	18	T	50		
DEL	07						

Commodore Shift and Control Key
PEEK(653) $028D
IF BIT 0=Shift
IF BIT 1=Commodore
IF BIT 2=CTRL Key

VIC CHIP REGISTERS

Decimal	Hex	Description
36864	$9000	BITS 0-6 Horiz. Centering
36865	$9001	Vertical Centering
36866	$9002	BITS 0-6 # of Columns
36867	$9003	BITS 0-6 # of Rows
36868	$9004	BIT 0 Sets Char. Height
36869	$9005	BITS 0-3 Char. Gen. Addr.

Bits	Decimal	Hex
0000	32768	$8000
0001	33793	$8400
0010	34816	$8800
0011	35840	$8C00
1000	00000	$0000
1001	XXXXX (unavailable)	XXXX
1010	XXXXX	XXXX
1011	XXXXX	XXXX
1100	4096	$1000
1101	5120	$1400
1110	6144	$1800
1111	7168	$1000

Decimal	Hex	Description
36870	$9006	Horiz. Pos. Light Pen
36871	$9007	Vert. Pos. Light Pen
36872	$9008	Paddle X
36873	$9009	Paddle Y
36874	$900A	Voice1
36875	$900B	Voice2
36876	$900C	Voice3
36877	$900D	White Noise
36878	$900E	Volume Bits 0-3 Auxillary Color Bits 4-7
36879	$900F	Screen and Border colors Bits 4-7 Screen color Bit 3 RVS ON/OFF Bits 0-2 Border Color

EXPANSION/CARTRIDGE CONNECTOR

Pin	Function	Pin	Function
1	GND	A	GND
2	CD0	B	CA0
3	CD1	C	CA1
4	CD2	D	CA2
5	CD3	E	CA3
6	CD4	F	CA4
7	CD5	H	CA5
8	CD6	J	CA6
9	CD7	K	CA7
10	BLK1	L	CA8
11	BLK2	M	CA9
12	BLK3	N	CA10
13	BLK5	P	CA11
14	RAM1	R	CA12
15	RAM2	S	CA13
16	RAM3	T	I/O2
17	VR/W	U	I/O3
18	CR/W	V	SO2
19	IRQ	W	NMI
20	NC	X	RESET
21	+5V	Y	NC
22	GND	Z	GND

1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22

A B C D E F H J K L M N P R S T U V W X Y Z

JOYSTICK CONTROL REGISTERS

Decimal	Hex	Description
37139	$9113	DDR Port A Set to 0 Input
37137	$9111	PORTA BIT2 = UP BIT3 = DOWN BIT4 = LEFT BIT5 = FIRE
37154	$9122	DDR PORT B Set to 127 to read JOYSTICK 255 for KEYS
37152	$9120	BIT7 = RIGHT

SCREEN MEMORY LOCATIONS

Unexpanded VIC

Decimal	Hex
7680-8191	$1E00-$1FFF

Expanded VIC

Decimal	Hex
4096-4607	$1000-$11FF

COLOR RAM LOCATIONS

Unexpanded VIC

Decimal	Hex
38400-38911	$9600-$97FF

Expanded VIC

Decimal	Hex
37888-38399	$9400-$95FF

TO SET SCREEN TO COLOR C
POKE36879,
(PEEK(36879) and
15)ORC*16

TO SET BORDER TO COLOR C
POKE36879,
(PEEK(36879)and
248)ORC

TO SET INVERSE VIDEO,
POKE36879,
(PEEK(36879)and
247)

GAME PORT
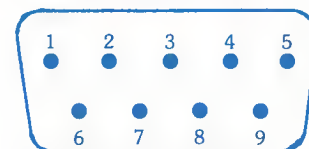
Pin	Des.	Note
1	JOY0	
2	JOY1	
3	JOY2	
4	JOY3	
5	POTY	
6	LT PEN	
7	+5	100MA
8	GND	
9	POTX	